CLAIMS

We claim:

1. A semiconductor die package comprising:

a semiconductor die;

a heat spreader; and

a thermal interface material between the semiconductor die and the heat spreader, wherein the thermal interface material has a modulus of elasticity in the range of 1-500 kPa.

2. The semiconductor die package according to claim 1, further comprising a substrate on which the semiconductor die and heat spreader are mounted.

3. The semiconductor die package according to claim 1, further comprising a substrate, and wherein the semiconductor die is a flip chip mounted on the substrate.

4. The semiconductor die package according to claim 1, wherein the semiconductor die is a central processing unit of an electronic package.

5. The semiconductor die package according to claim 1, wherein the heat spreader comprises a lid in heat conducting relation with the semiconductor die via the thermal interface material and wherein a heat sink is provided in heat conducting relation with the lid.

6. The semiconductor die package according to claim 1, wherein the modulus of elasticity of the thermal interface material is > 5 kPa.

7. The semiconductor die package according to claim 1, wherein the post end-of-line and post reliability testing thermal resistance of the thermal interface between the semiconductor die and the heat spreader is < 1 cm^2 °C/Watt.

8. The semiconductor die package according to claim 1, wherein the thermal interface material is a cured, lightly crosslinked polymer gel.

9. The semiconductor die package according to claim 8, wherein the polymer gel is filled with material selected from the group consisting of metal

and ceramic.

10. The semiconductor die package according to claim 8, wherein the thermal interface material has a bulk thermal conductivity of 1-20 W/mk.

11. The semiconductor die package according to claim 1, wherein the thermal interface material has a bulk thermal conductivity of 1-20 W/mK.

12. The semiconductor die package according to claim 1, wherein the thermal interface material is a gel which has a thickness between the semiconductor die and the heat spreader in the range of .001 - .010 inch.

13. A method of making a semiconductor die package comprising:

assembling a semiconductor die and a heat spreader with a thermally conductive gel therebetween; and

curing the gel to form a thermal interface material which has a modulus of elasticity in the range of 1-500 kPa.

14. The method according to claim 13, wherein the gel is a polymer

which, after the curing, is lightly crosslinked.

15. The method according to claim 14, wherein the polymer is filled with material selected from the group consisting of metal and ceramic.

16. The method according to claim 13, wherein the gel has a bulk thermal conductivity of 1-20 W/mK.

17. The method according to claim 13, wherein the thickness of the gel between the semiconductor die and the heat spreader is in the range of .001-.010 inch.

18. The method according to claim 13, wherein the modulus of elasticity of the cured gel is > 5 kPa.

19. The method according to claim 13, wherein the thermal resistance of the cured gel between the semiconductor die and the heat spreader is < 1 cm^2 °C/Watt.

20. The method according to claim 13, including mounting the semiconductor die and heat spreader on a substrate.

21. The method according to claim 13, wherein the semiconductor die is a flip chip mounted on a substrate.

22. The method according to claim 21, wherein the heat spreader comprises a lid which is mounted on the substrate during the assembling so as to extend over the flip chip.

23. The method according to claim 13, wherein the semiconductor die is a central processing unit of an electronic package.

24. A method of dissipating heat from a semiconductor die package, comprising:

transferring heat from a semiconductor die in a semiconductor die package to a heat spreader in the package with a thermal interface material between the semiconductor die and the heat spreader;

wherein the thermal interface material is a gel which has a modulus of

elasticity in the range of 1-500 kPa.

25. The method according to claim 24, wherein the thermal resistance of the gel is < 1 cm^2 °C/Watt.

26. The method according to claim 24, wherein the modulus of elasticity of the gel is > 5 kPa.

27. The method according to claim 24, wherein the semiconductor die package is an electronic package and the semiconductor die is a flip chip, central processing unit.

28. A microprocessor package comprising:

a flip chip, central processing unit mounted at a front thereof on a substrate;

a lid mounted on the substrate so as to extend over a back of the flip chip; and

a thermal interface material between the underside of the lid and the back of the flip chip, the thermal interface material being a gel which has a modulus of

elasticity in the range of 1-500 kPa and a thermal resistance of $< 1\ cm^2\ °C/Watt$.

29. The microprocessor package according to claim 28, further comprising a heat sink in heat conducting relation with the lid.